Duffill Watts & King Ltd
CONSULTING ENGINEERS

INFRASTRUCTURE DEVELOPMENT

Digital Terrain Model, Urban Development, Indonesia

Cost-effective integrated infrastructure reduces the total cost of urban development and maximises the land available for revenue generating development.

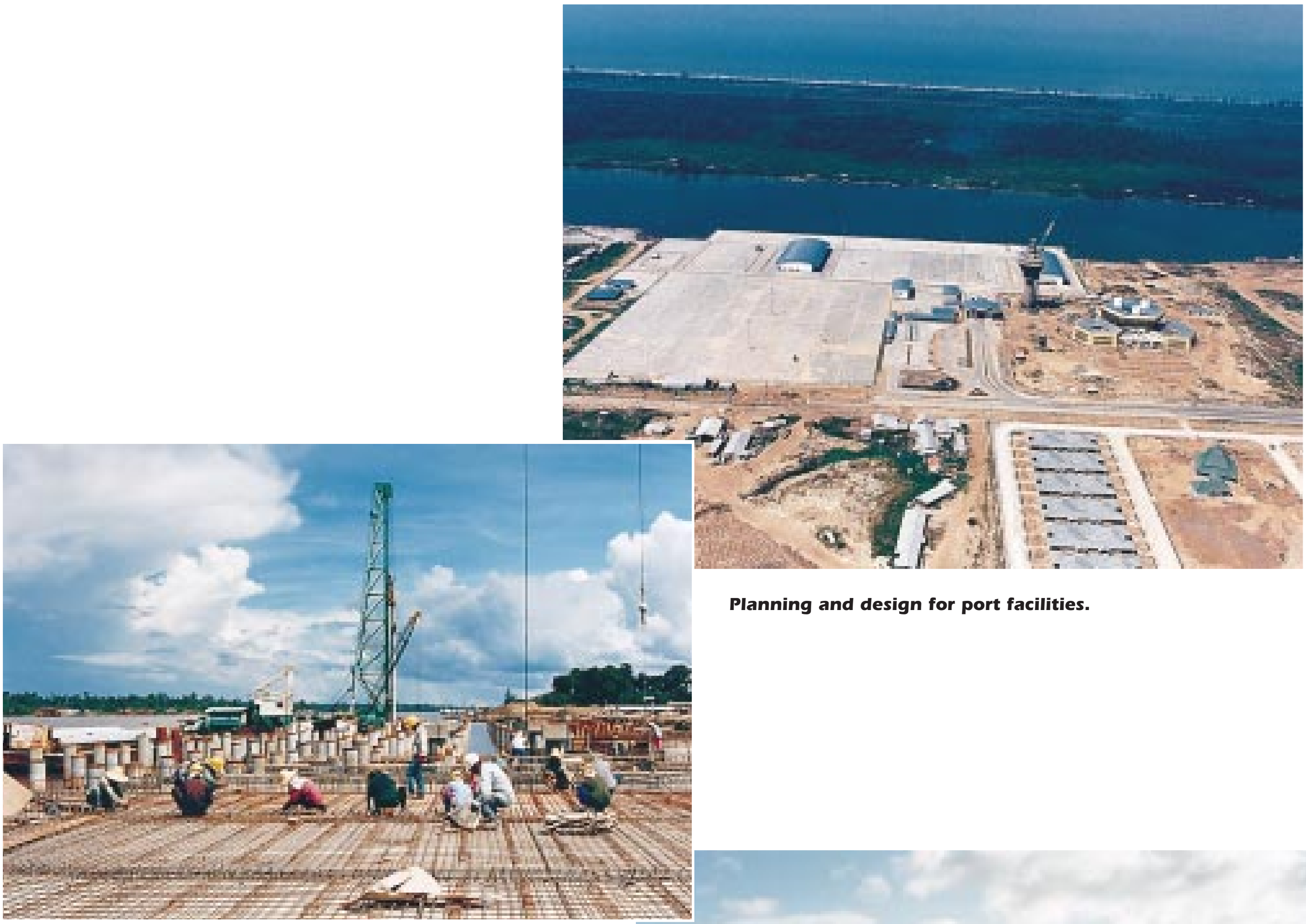
Duffill Watts & King Ltd has been designing urban and rural infrastructure for five decades, providing a full range of infrastructure design services for New Zealand and South-East Asian clients.

Infrastructure Planning, Tourist Resort, Otago, New Zealand

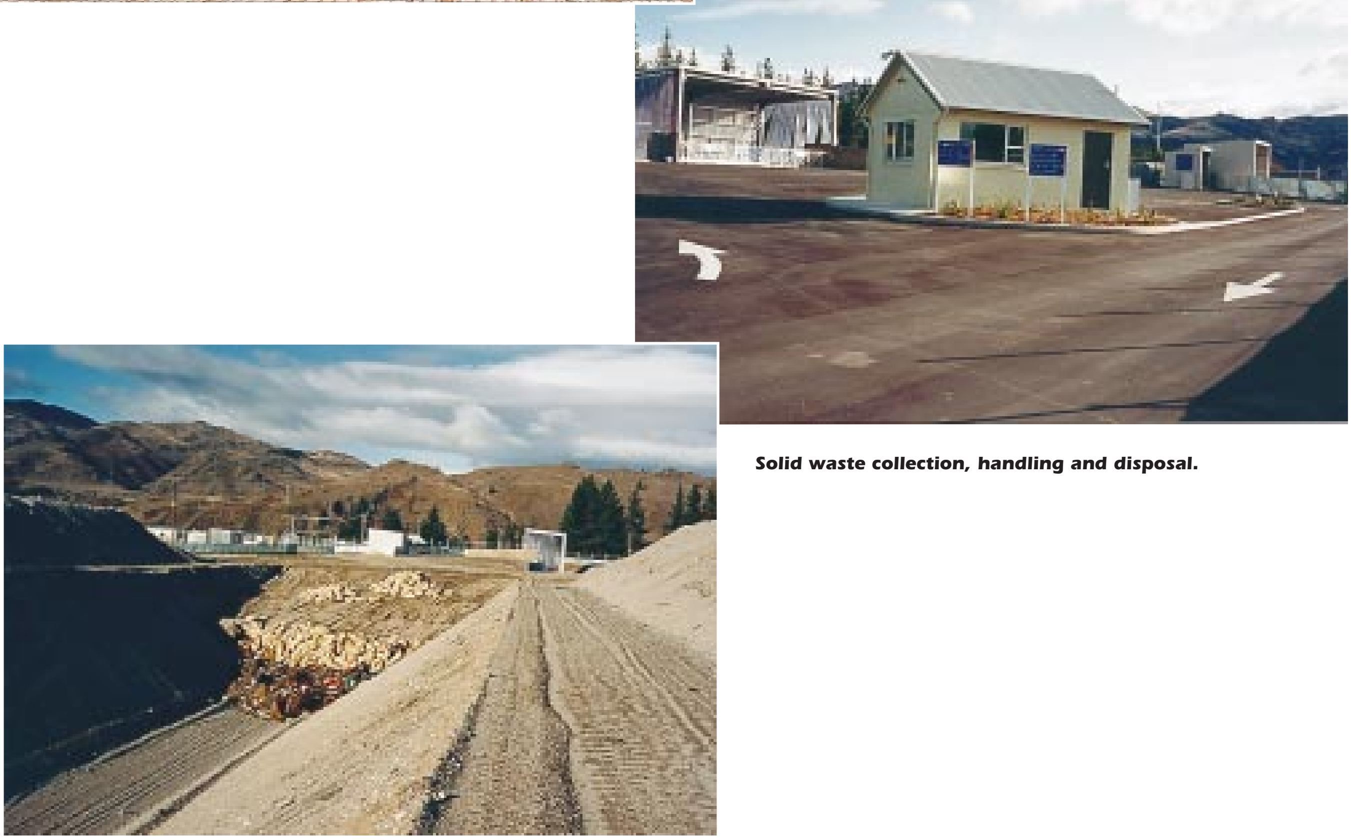
Infrastructure development includes roads and bridges, water treatment and supply, wastewater collection and disposal, stormwater systems, power supply and telecommunications.

Duffill Watts & King Ltd has been engaged by local government bodies and private land developers in New Zealand and South-East Asia to undertake major infrastructure design projects because of the Company's extensive experience in infrastructure development.

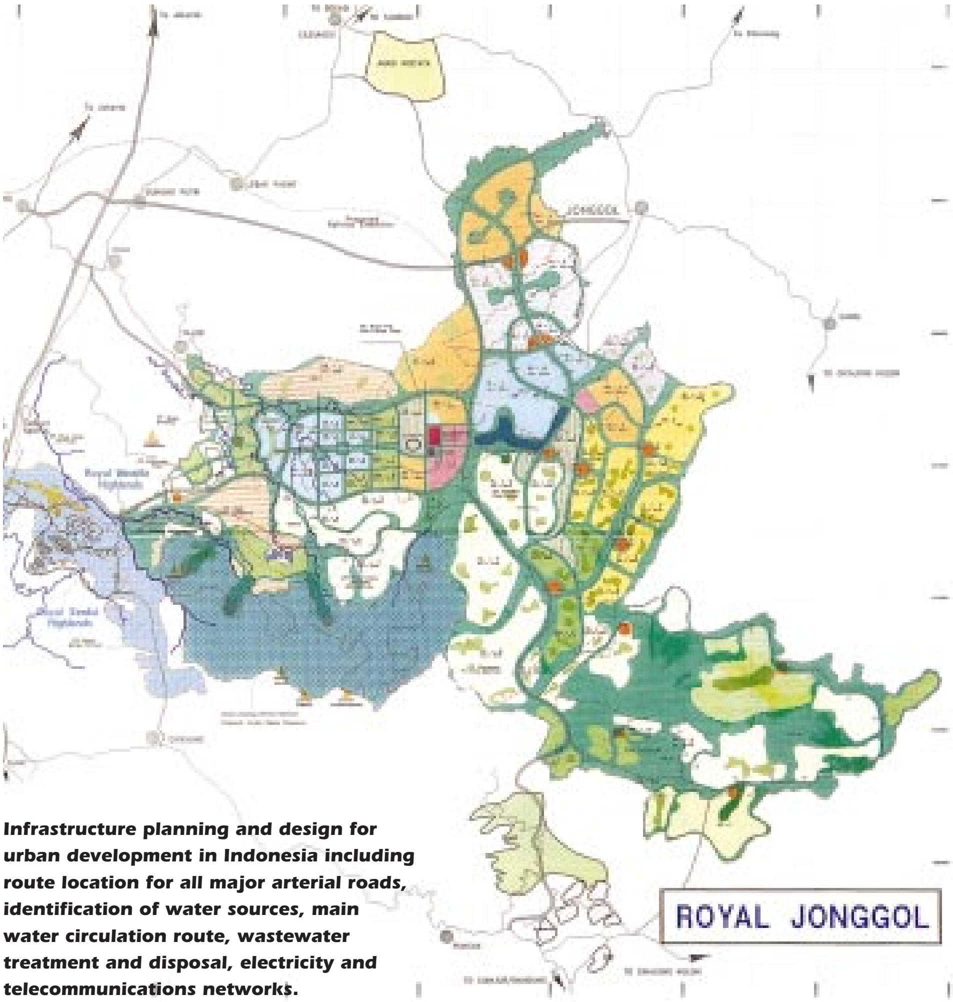
In 1975, the Company was engaged to design and implement major changes to Cromwell's infrastructure. Hydro-electricity development increased Cromwell's population five-fold, and the business district had to be relocated as the original area was to be permanently flooded.



Planning and design for port facilities.



Solid waste collection, handling and disposal.

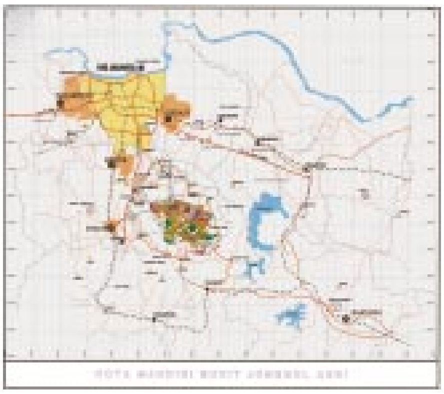


Infrastructure planning and design for urban development in Indonesia including route location for all major arterial roads, identification of water sources, main water circulation route, wastewater treatment and disposal, electricity and telecommunications networks.

The infrastructure changes required extensive negotiations with the New Zealand Government to define relative responsibilities for work to be carried out. Duffill Watts & King Ltd was part of the negotiating team, materially assisting with the formulation of an administration agreement that is quite possibly unique in New Zealand. The infrastructure changes were implemented within the allocated timeframe and budget.

In 1985, Duffill Watts & King Ltd was appointed as principal New Zealand adviser to the promoter of a 450 ha tourist development in the Queenstown area. The Company provided services including project management and planning, cost estimating, infrastructure design, structural engineering, local authority liaison, determination of District Plan and Resource Management requirements, and liaison with professional advisers in other disciplines both in New Zealand and overseas.

For other projects, the Company has worked extensively with developers, land use planners and golf course designers to provide master plans and detailed designs for resort and residential developments. Developed land areas have ranged from 600 ha to 30,000 ha, with design populations from a few thousand to 2 million people.



Bukit Jonggol

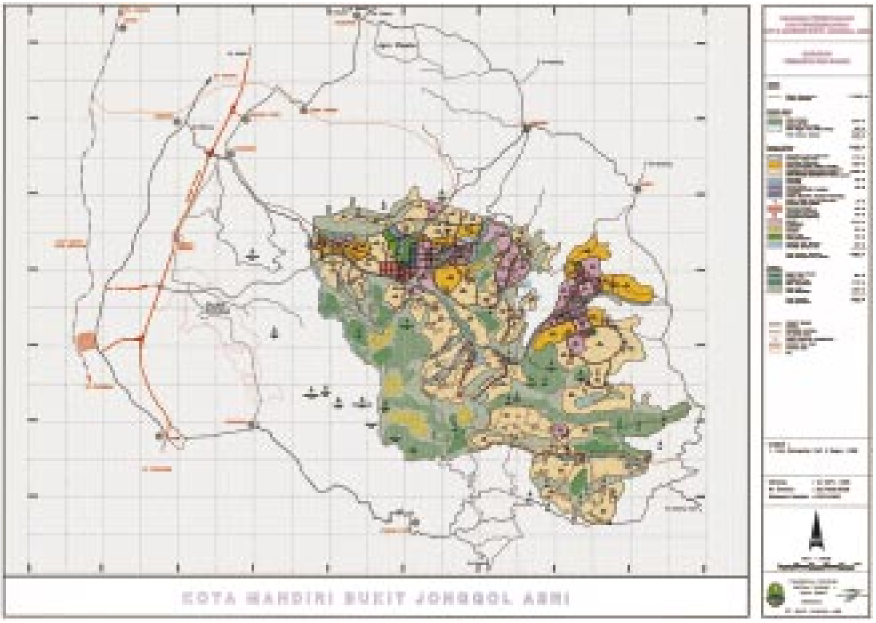
This project was developed for PT Royal Persada Land on a 30,000 hectare "green grass" site south of Jakarta, Indonesia.

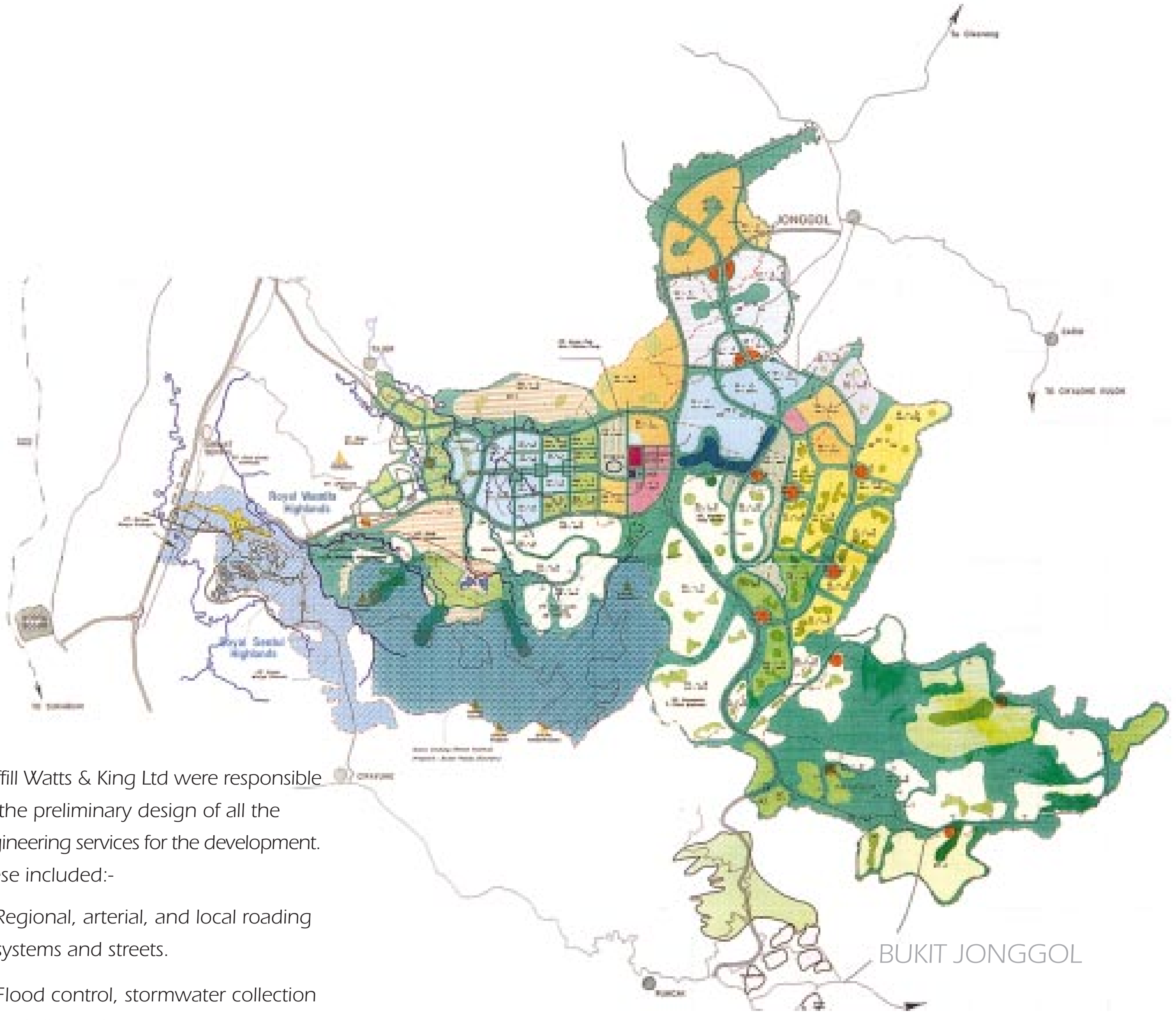
Duffill Watts & King Ltd were responsible for the overall control and delivery of all technical and engineering inputs necessary to develop the design for this proposed new city.

The design for the new city was focused on achieving the maximum economic benefits for both those who invested in the city, and for those who would work and live there. The modern design and servicing concepts were expected to provide employed people with up to a 30 percent increase in disposable income without any increase in salary and wages. This was expected to be achieved by decreasing home-to-work travel costs and reducing absenteeism from ill-health. Employers would receive similar benefits from higher productivity and lower effective labour costs.

In the Investigation Phase, Duffill Watts & King Ltd were responsible for providing or arranging and managing all of the following:-

- Establishment of survey control over the whole site together with the provision of topographical survey for the 15,000 hectares proposed for intensive development.
- Geological investigations to locate the unstable areas of superheated clays caused by volcanic activity and thereafter the provision of engineering properties of the soils of the site.
- Hydrological studies to determine sources of water, from the steep undevelopable upland areas above the city, to provide an adequate water supply based on annual buffer storage dams.
- Determination, in conjunction with Central Government Authorities, of suitable regional roading routes to connect the new city to its areas of supply and demand, to Jakarta, to the export port of Tanjung Priok, and to the international airport.
- Assessment of the potential of the development to add to the serious problems and/or intensity of flooding of Jakarta and the demonstration that the development would neither cause, nor add to, Jakarta's flooding problems.
- Arrangements for the provision of modern high-speed telecommunication systems connected to both the national and international telecommunication gateways.
- The internal arterial roading network to provide efficient travel between the outside of the city and all of its productive sectors within, and for all travel between those sectors within the city and its residential areas.
- Technical inputs into a demographic study of three of Indonesia's major industrial cities to determine the optimum land use ratios for the new city and their inter-relationship so as to achieve both optimum land use and operating efficiency and cultural requirements for the new city.



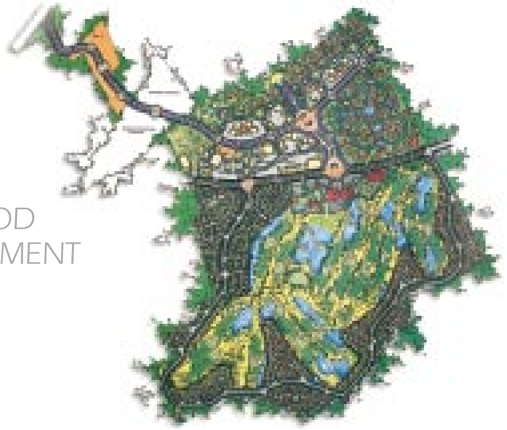


Duffill Watts & King Ltd were responsible for the preliminary design of all the engineering services for the development. These included:-

- Regional, arterial, and local roading systems and streets.
- Flood control, stormwater collection and disposal.
- Water, source security, collection, treatment, storage and reticulation.
- Sewage collection, treatment, and disposal.
- Electricity supply (high, medium, and low tension) and reticulation.
- High-speed, high-capacity telecommunication layouts.
- Solid waste collection and disposal.
- Public open space irrigation systems.

The design included provision and allowances for all Government, Local Government, recreation, amenity and religious provisions and requirements, to meet and fully comply with Indonesia's devolved government structures and their cultural requirements.

The preliminary design was taken to feasibility study stage so as to enable the cost of the project to be determined with reasonable accuracy. A further study was then undertaken to determine the most cost effective stage development strategy which would minimise initial capital expenditure and at the same time provide an initial "critical mass" development that would be self-sustaining and provide the basis for the long-term development of the city.



Pulau Basin Development

A major Island resort/commercial development planned for construction on the island of Pulau Basin, Myanmar in the Andaman Sea for a private client.

The development consisted of 3 separate but complementary components:-

- A modest amount of permanent residential accommodation.
- Significant tourist accommodation complete with gambling facilities.
- A Duty-free area designed to serve the local region.
- The development is served by a new port, a regional airport, extensive recreational facilities, and a marina.

Duffill Watts & King Ltd provided full engineering support to the Project Planner, RNL Design, of California and undertook a critical constraints study, an investigation to determine a source of water, a preliminary design for the port, concept design for passenger and goods transport craft to operate from the mainland, and concept design of the airport and infrastructure facilities.

Lakewood City Development

Lakewood City is a high end mixed development under construction on the outskirts of Cabanatuan in the Philippines for Landco Pacific Corporation. The project provides for 600 houses, an international golf course with a "wet" driving range, fully serviced sports centre with banquet hall facilities, and extensive retail facilities.

Duffill Watts & King Ltd were engaged to undertake a peer review of the detailed infrastructure designs prepared by local designers and covering arterial roading, streets, water supply system, golf course irrigation system, sewage collection and disposal, stormwater and particular flooding considerations, and electric and telephone services.

The work resulted in recommendations that would enable very significant saving in project development costs and at the same time as achieving these savings will have resulted in upgrading of infrastructure services to higher standards which would assist project marketing.

Vietnam Projects

Dan Kia Recreational Resort

This resort is planned by LKN Construction Ltd of Singapore for the development of an isolated 4000 hectare recreation destination resort within a 10,000 hectare recreational reserve.

The work included an initial "critical constraints" study of the infrastructure requirements for the project and thereafter the concept design for each of the engineering services required. A major task was the determination of a new 11 km access road through difficult steep country.

Schmidt High Technology Centre

This project for Schmidt Developments in Ho Chi Minh City, is for the development of a 10 hectare industrial site designed specifically as a High Technology Services Centre.

The work carried out to feasibility standard included the concept design for stand-alone services for the project together with full cost estimation for the project development, and determination of an optimum economic stage development sequence.

High Tech Industrial Park

This project, for a confidential client in Ho Chi Minh City, is for the development of an 800 hectare high quality industrial park designed for high technology clean industrial production.

The work included investigations and concept design, all to pre-feasibility standard, for stand-alone engineering services for the development.

The services included sourcing water supply, sewage disposal, flood control and storm water disposal, and arterial roading both to the project and within.

BUKIT SENTUL DEVELOPMENT

Bukit Waskita New Town

This project was the development of a small industrial town south of Jakarta, Indonesia, for PT Royal Persada Land.

The planning, undertaken by McErlane & Associates of California, was for a balanced, self contained, industrial town containing residential housing, worker housing, industrial factory sites, with commercial, institutional, educational and recreational facilities. The town has a projected population of 70,000 people on the land area of 1000 hectares.

Duffill Watts & King Ltd were responsible for the management systems to control the project engineering, the direction and overview of all engineering investigations and the conceptual design for the project infrastructure.

Bukit Sentul Town Development

This project was for the "green grass" development of a 13,000 hectare Golf-Residential project 45 minutes south of Jakarta for PT Benua Bahagia Karya. The project includes a Garry Player designed golf course.

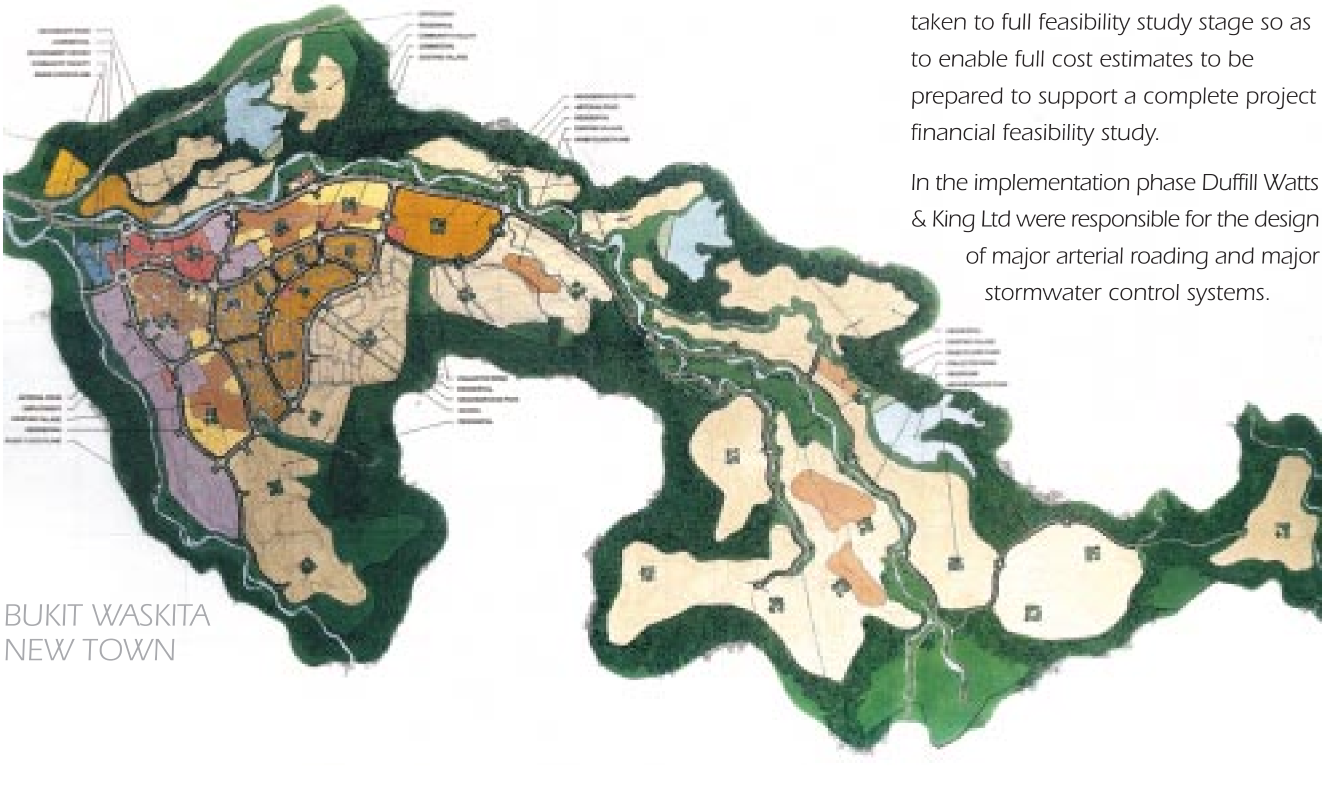
Duffill Watts & King Ltd were responsible for survey control and arranging and obtaining topographical surveys, geological and soils investigations, hydrographic investigations for an annual buffer storage dam water supply system, and investigations into electricity supply options.

Duffill Watts & King Ltd provided full technical support to the Land Planner, RNL Design of California, and undertook the concept design of all the engineering services necessary for the development including:-

- Arterial roading
- Internal roading and streets
- Water supply, storage, and reticulation
- Wastewater collection, treatment and disposal
- Stormwater estimation and disposal
- Solid waste collection and disposal
- Electricity supply source
- Telecommunications system
- Golf course irrigation and drainage systems
- Stage development implementation planning.

The infrastructure concept design was taken to full feasibility study stage so as to enable full cost estimates to be prepared to support a complete project financial feasibility study.

In the implementation phase Duffill Watts & King Ltd were responsible for the design of major arterial roading and major stormwater control systems.

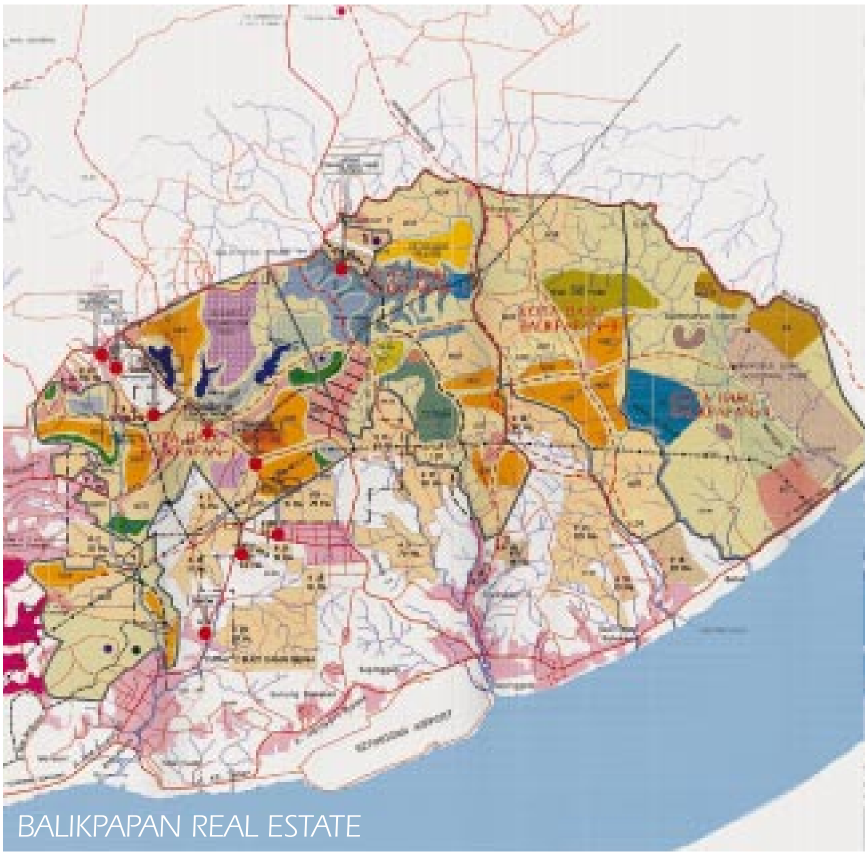


BUKIT WASKITA NEW TOWN

Balikpapan Real Estate

This project was for the development of low end real estate to serve the economic expansion of this rapidly developing area of Indonesia. The project was planned on behalf of a confidential client at the request of Local Government Authorities. Balikpapan is founded on very soft friable clays subject to rapid erosion in even modest rainfall. Small-scale developments previously executed, without overall planning and proper controls were resulting in erosion and failures. This project was required to minimise earth works, provide complete surface stabilisation, and have adequate controlled stable stormwater systems.

Duffill Watts & King Ltd provided full support to the Land Planner, Roger McErlane & Associates, in the preliminary assessment in the pre-feasibility study for this development.



BALIKPAPAN REAL ESTATE

Dago Pakar Resort

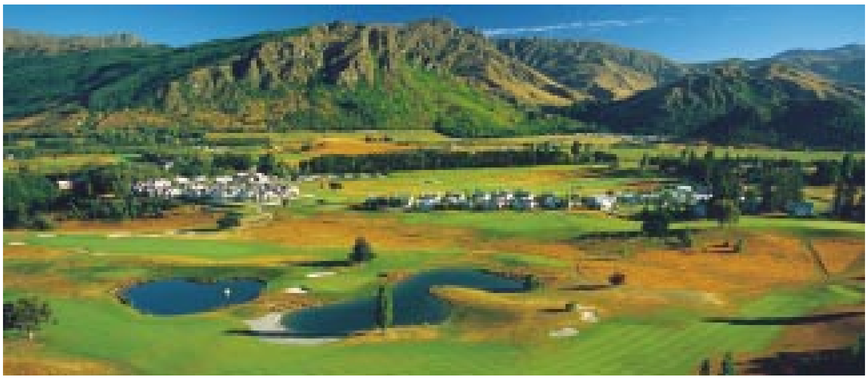
This project was the development of a very high-quality Golf/Residential resort in Bandung, Indonesia. designed for PT Bandung Pakar.

The project has been planned on 500 hectares, with two international quality golf courses, a hotel and conference centre, 2500 houses, and retail and amenity facilities. The project site is two very steep sided, converging valleys with the rivers at the bottom of these valleys draining large upland areas.

Duffill Watts & King Ltd were responsible for establishing survey control, managing topographical surveys, geological and soils investigations, and for investigations for water supply.

Duffill Watts & King Ltd undertook concept design, in support of the Land Planners, Edaw Inc. of California, of all the engineering services required for the project. In particular extensive computer model studies were carried out to optimise the 3 million cubic metres of earthworks required for the project. These studies achieved major project cost savings.

DAGO PAKAR RESORT DEVELOPMENT



MILBROOK RESORT
& COUNTRY CLUB

Millbrook Resort & Country Club

Situated at Arrowtown, New Zealand in an area of high natural beauty.

The development is a residential and tourist golf resort. It contains a 36 hole Bob Charles designed golf course, extensive tourist accommodation in medium rise and single storey formats, together with high end permanent residential accommodation and with the supporting facilities and amenities.

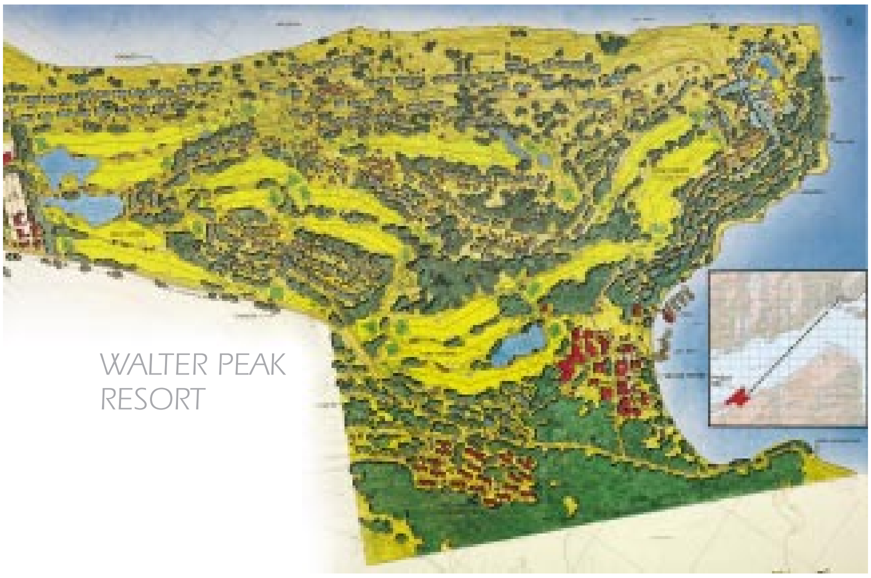
Duffill Watts & King Ltd were responsible for the technical support to the Land Planner, Boffa Miskell Ltd, technical support for the Statutory Approvals and Consent process, the investigations for the concept design, detailed designs and construction implementation of all the infrastructure for the project. As well Duffill Watts & King Ltd undertook the structural design of the building structures.

Walter Peak Resort

This project was planned in an isolated area of high natural beauty at Queenstown, New Zealand for Walter Peak Resort Ltd. The project is designed as a Residential/Tourist Destination Resort. It provides an international golf course, a high-rise hotel, low rise tourist accommodation, permanent residential accommodation, together with retail, entertainment, and amenities facilities suitable for catering for a population of 4000.

Duffill Watts & King Ltd were responsible for all the project investigation phase. Thereafter Duffill Watts & King Ltd provided full technical support to the Land Planner, RNL Design of California, necessary to undertake the concept planning and for the provision of full stand-alone infrastructure to this isolated site. The work included the provision of wharfs and goods transport facilities to link the resort to the local tourist town of Queenstown.

Duffill Watts & King Ltd were responsible for the management of all the Statutory Consents and Approvals, all of which were obtained without formal objection.



WALTER PEAK
RESORT

Cromwell Town Redevelopment

The construction of the Clutha Hydroelectric Power Project necessitated the relocation of the existing town of Cromwell from land to be flooded. The new town was to cater for the expected expansion of the area resulting from the hydroelectric development and act as the centre for the Power Project workforce.

Duffill Watts & King Ltd were engaged by the Local Authority of Cromwell and were responsible for technical matters pertaining to the redevelopment of the town. The work included assistance and support to the Local Authority for negotiations with Central Government for the funding of the project, technical support for a complex agreement with Central Government for the implementation and subsequent operation of the new town, technical support for the Planning and Consents and Approvals process, all the necessary investigations, the concept design, detailed design, and construction implementation of:-

- Relocation of regional roading
- Internal roads and streets
- Water supply, treatment and reticulation
- Sewage collection, treatment, and disposal
- Stormwater collection and disposal
- Solid waste collection and disposal
- Recreation facilities and amenities
- Public open space irrigation systems
- Technical support for the design of, and the occupation by compensatees of the replacement retail facilities for the town
- The subsequent engineering oversight and engineering management of the new town

CROMWELL TOWN REDEVELOPMENT

Milford Sound Redevelopment

This project was undertaken for a consortium of Local Government and tourism service providers.

Milford Sound is a beautiful fiord located on the isolated and uninhabited West Coast of New Zealand. Located in an area of high environmental sensitivity and natural beauty Milford Sound is New Zealand's most popular tourist destination.

The project involved the redevelopment of the existing marine and land-based tourist and transport facilities to cater for 4000 tourists per day. This required the creation of a new harbour of absolute minimum dimension to minimise the environmental impact, the dredging and berthage to operate new tourist boats, and the terminal, parking, and infrastructure support necessary to operate in complete isolation on a 365 day basis.

MILFORD SOUND REDEVELOPMENT